



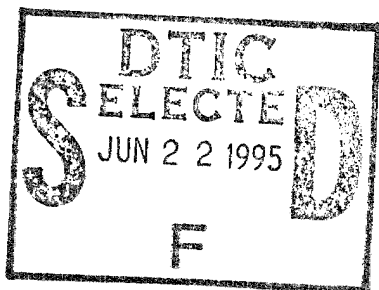
STRATEGY RESEARCH PROJECT

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COMMAND AND CONTROL IN THE 21ST CENTURY A CONSTRUCT OF THE FUTURE

BY

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Command and Control in the 21st Century

A Construct of the Future

by

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Abstract

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New technologies and changes in organizational hierarchies are being touted as the keys to the future. But we approach the future with short, incremental steps - using today's paradigms. In an attempt to move beyond this gradualism, this paper proposes a 30-year hypothetical leap into a future military environment to anticipate its command operations and structure. This "fast-forward" projection reveals major issues in decision-making and leadership. It allows us to analyze the effects of flattened organizations and to re-assess the role of the commander. Finally, assuming we transition to an organization similar to this 30-year model, it identifies possible near-term actions required to effect such long-term changes.

Increased horizontal and vertical awareness will enhance commanders' coordination and decision-making, but the role of senior commanders and their relationship to subordinate commanders and their troops will change. To gain the full benefit of a flattened organization, commanders will rely more on intuitive decision-making abilities, which in turn will redefine the path to command and foster new relationships between levels of war. Reflecting on the questions raised by this projection will help us determine a future that will best serve our national and global interests.

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Command and Control in the 21st Century

A Construct of the Future

Our military Services continue to grapple with issues pertaining to the shape, content and functions of the military in the 21st century. We hear every day such buzz words as downsizing, fighting smarter, digitizing, flattening, and empowering. But few have described the command operation and structure that will successfully lead these downsized, digitized organizations. With the increased capabilities provided by information age technology, we can flatten the command and control function of our military organizations, empowering commanders at all levels. But, is this the best way to operate? How will these newly empowered forces function on a degraded battlefield?

To study the ways a redesigned force will change the command function, this paper first hypothesizes a concept of operation and propose a command structure for 2025.¹ This model then raises implications of the changes and provides the basis for proposed near-term transitions. We need a model of how we plan to fight in the future in order to recruit, train and educate the force while building or buying the technology to support it.

The military inherited the concept of flattened organizations and empowered workers from industry, where the advantages of efficient information management are tied to profits. A modern, sophisticated, demanding public forced industry to develop new methods to ensure customer satisfaction through greater flexibility in customer relations and increased adaptability of products. As a result, the Industrial Age work model is no longer valid. In this model each worker gained expertise in just one facet of the process. As systems or products became more complex, management added many layers of control to facilitate supervision and coordination of these specialists. The management layers created their own replicated hierarchies of specialized tasks resulting in added work with no added value. Business innovators found that information age technology enabled management to increase their span of control and use generalized rather than specialized workers. This resulted in flatter corporate organization and reduced duplication. Decreasing or eliminating middle management has allowed front-line employees to make timely decisions and provide valuable feedback for product updates. This entire transformation has lowered costs, speeded up production, and finally, generated greater profits.²

Our military leadership has been greatly influenced by this new command and control concept. Even so, our current command and control system consists of multiple,

unrelated, vertical hierarchies. This is not surprising, since it mirrors organizations established on the antiquated model used in business. Multiple levels of command each maintain a set of functional staffs, often performing the same processes, separated only by command or functional boundaries. But, information technology gives us the ability to build command and control systems that share data between functional areas and commands.

However, we are currently using cutting-edge technology to automate the support structure created for a 19th century commander. Instead we should develop new concepts of command and control incorporating the tools of the information age. The future command and control support structure must provide an environment that enhances the capabilities of its users and optimizes information value. Once we identify a concept of future operations and organizational structure, training and education and doctrine can follow.

Most current discussions of command and control are based on technical descriptions of computers and communications equipment. However, Joint Publication 1-02 defines command and control as the exercise of authority and direction by the commander over designated forces in order to accomplish the mission.³ The principal elements of the system providing command and control are people and information. People interact with each other and utilize

the equipment, and the information is acquired or used to make and disseminate decisions. The final element of the command and control system is the support structure, which includes the organization, procedures, equipment, facilities, training, education, and doctrine. So the computer and communications equipment is simply a small, but necessary part of the system.⁴

Joint Publication 3-0, Doctrine for Joint Operations, details the functions of command and control required by Joint Force Commanders.⁵ Service doctrine amplifies these functions by specifying more fully the qualities needed to command warfighters. Field Manual 100-5, Operations, probably describes them best as "two vital components - decision making and leadership." The commander must position himself so he can best assess and influence the battle, poised to make the right decisions at the right times, and providing the leadership to inspire action and to take responsibility for the decisions.⁶

Any long-range concept of the future builds upon the present. The Services have started down the path formulating the next doctrine, generating viable concepts for the next 5-15 years. While service-unique differences remain, many similarities in approach and goals appear when examining Service concepts.

The Training and Doctrine Command Pamphlet 525-5, Force XXI Operations, suggests that the Army's definition of

Battle Command may need to emphasize art more than science because of the unpredictability of future scenarios. The Pamphlet also proposes the need for rapid adjustments because of changing "temporal and spatial variations" of the battlefield. It anticipates a flexible command structure that can share information in both the traditional hierarchical and throughout a new networked non-hierarchical structure. A networked structure promotes the concept of a flexible chain of command. Technology will shorten the decision-making-to-action time, thus blurring the distinctions of the strategic, operational, and tactical levels of war. Commanders must be able to act upon their intuitive sense of the battlefield; they must communicate their intent to the individual soldiers, who then may act independently if necessary.⁷

The Air Force hopes to better align the responsibility and authority of its commanders. Through decentralization, the Air Force will reduce large headquarters staffs and grant field commands more authority. The emerging command structure will push control of decisions to the lowest levels possible. Resource consolidation leading to mergers in tactical air commands is the subject of a second focus. This is consistent with the Air Force's promotion of central control of air forces under the combatant commander.⁸ The consolidation effort also recommends that commanders control all logistic and

administrative processes supporting their units' operation.⁹ The Air Force appears to be consolidating command and control in order to service its need for technological solutions and to strengthen the tie to its logistics train.

Naval forces are traditionally decentralized commands. In preparing for the 21st century, the Navy will move to a more tailored force of ships assigned to a task group based on mission requirements.¹⁰ The Navy proposes the least change in preparation for the information age. While command and control support systems will provide a more consistent view of naval battlespace, the Navy's mission and tools to accomplish that mission are not changing.¹¹ Well-adapted to decentralized command, Navy commanders are becoming more aware of centralized control capabilities.

The Marine Corps believes that the concepts of command described in maneuver warfare doctrine will hold true in information age war as well. Mission-type orders and decentralized control are the hallmarks of the doctrine, which requires subordinate commanders to understand the intent of their orders and allows them the opportunity to pursue their mission with minimal guidance.¹² Developing concepts predict an increased tempo, task-organized missions, and changing force and command structures requiring flexibility and intuitive decision-making by the commander. While most of the internal command and control

commander. While most of the internal command and control structure will remain, relations with commands external to the Marine Corps' combat structure may change radically.¹³

The greatest impact of the information age on the function of command and control will be felt in the Army and Marine Corps, primarily because they are both people intensive services. Their concepts of command are very similar. In the near-term, both acknowledge a requirement for increased flexibility, continued use of decentralized control, and an emphasis on intuitive decision-making. However, these emergent concepts reflect current capabilities and structure resulting in incremental changes. Perhaps that is justified, but will it lead to our desired future? We must attempt to conceptualize future doctrine beyond existing capabilities in order to examine unexplored possibilities and validate long-range goals.

The foregoing review of current concepts provides the jumping off point for discussing future concepts.¹⁴ Depicting a hypothetical future will provide a foundation to facilitate discussion beyond current long-range plans. It begins with some assumptions about the environment and, within that setting, projects a concept of operation and the command structure of the force. While many debatable positions are stated as fact, the proposed future is presented to study the model's effect on the commander's decision-making and leadership role.

In 2025, niche wars continue to arise in various regions of the world. In addition, a peer competitor equaling the United States in economic strength and/or technology shares in world power. The United States continues to pursue a National Security Strategy similar to one of Engagement and Enlargement, requiring a warfighting military capable of overseas presence, peacekeeping, and peacemaking operations. Because of real threats to United States industry and acts of terrorism, the military often operates separately or in conjunction with civil authorities for internal defense.

Technology continues to advance, providing commanders with unlimited access to information and equipment configured and sized to the unit's requirements. Precision strike weapons are available on command and include those weapons capable of defeating or neutralizing 1st wave competitors.¹⁵ Tanks and aircraft carriers, no longer considered the focal point of operations, are mostly things of the past, along with large logistics bases and command centers. All of these present too rich a target in a precision strike era. Manned aircraft, deemed too expensive and inefficient, are no longer the primary focus of aviation. Weapons and their platforms exploit smaller, faster, lighter technologies with an emphasis on personal precision weapons.¹⁶ Command and control support systems

provide seamless audio and visual information and decision support systems to commanders at all levels.

Although the force structure is small, military capabilities greatly exceed those of 1995. A division with 4000 personnel has greater combat effectiveness than one of 15,000 in the past. A platoon-sized unit controls an area comparable to that of a Desert Storm era battalion.¹⁷ The military of 2025 is a small, light, but well armed force, capable of responding to a myriad of tasks or missions.

Based on the continuing National Security Strategy, the missions of our 2025 armed forces continue to be ones of deterrence, warfighting, peacekeeping, and humanitarian relief. Performing these missions with 1st through 3rd wave allies and foes necessitates a cohesive force with one overriding doctrine, prepared for varied fast-paced and changing operations, supported in accord with their mission needs.

Strategic implications of operational and tactical actions and tactical implications of strategic actions require simultaneous conduct of all three levels of war. The pace and visibility of events emphasize the direct relation of the military element of national power to economic and political power. Effective operational and tactical as well as strategic commanders must be attuned to the interrelations of the elements of national power.

Operating forces conduct two basic types of missions - those requiring temporary use of force for peacemaking or those requiring continued presence, bridged by peacekeeping missions. Wars or other temporary operations require a force trained and prepared to fight major conflicts, where the emphasis is on winning and terminating a specific cause of conflict or instability. Continuing missions generally require a smaller force, capable of flexible but limited response, operating primarily as a part of a diplomatic solution. While these forces are structured similarly, their different view of missions require different training and doctrine.

Operations, both temporary and continuing, are executed under the auspices of a single Strategic Combat Commander. Since the battlespace has grown in size and dimension, dividing possible theaters by geography is no longer useful. This single commander has the global awareness required to coordinate effectively the use of force in compliance with the National Command Authority requirements. Task commanders assigned by the Strategic Combat Commander conduct operations using land, sea, air, and space forces as the mission requires. A mission such as "Defeat enemy's ability to command and control forces" may employ primarily strategic precision strike aviation and data systems neutralization forces. One requiring "Neutralize an adversary's logistics capabilities" may

employ a combination of general and special forces.¹⁸ Some of these forces assigned to a commander will not be physically present in theater. For example, operators of long-range precision strike weapons and information warfare weapons generally fight from their continental United States locations.

The concept of chain of command must continue, because accountability must be retained. But the chain of command for a unit may change by the mission. A Fighting Unit reports to a division commander in one mission; in the next, it reports to the theater commander. Although the hierarchy of command changes there must always be a definite chain of command, even though it appears abstract. Because of the availability of strategic precision strike weapons to tactical commands and to meet all demands for fires, fire support control is centralized by necessity.¹⁹

With the commander's normal span of control considered to be 1 to 10, the notional hierarchy of command is much flatter than in 1995. The mission commander's operating forces consist of Fighting Units selected by projected mission requirements. These Fighting Units are used in a "plug and play" mode, rotating in and out of theater when supplies and/or personnel are expended. They are then replaced by fresh units. When mobilized, reservists, formed in their own Fighting Units, blend easily

with active duty units. The increased span of control absorbs them seamlessly into the mission task structure.

A commander's staff consists primarily of intelligence gatherers, tacticians, and planners. Some of the staff operate from locations out of theater; tacticians, simulating the next operation, generally locate in the continental United States. Warfighting commanders do not have the luxury of time for logistics and administrative considerations. Therefore, the Support Command provides all combat service support.²⁰ Commanders' questions or requirements in these areas are resolved by the appropriate support unit or staff agency in the support command.

When not participating in actual operations, all forces are attached to commands within the Department of National Security (see Figure 1). The civilian staff provides policy guidance to the department. Warfighting Preparation Command includes all military forces that could ultimately be employed to defeat an enemy, ground combat forces to computer infiltration units. Support Command consists of all combat service support military forces and commercially contracted forces.

The Warfighting Preparation Command is tasked with training, war gaming and simulations, long-range planning, and doctrine development. Within the Command, the only permanently structured units are formed at the lowest tactical level. The Fighting Units generally contain not

Department of National Security

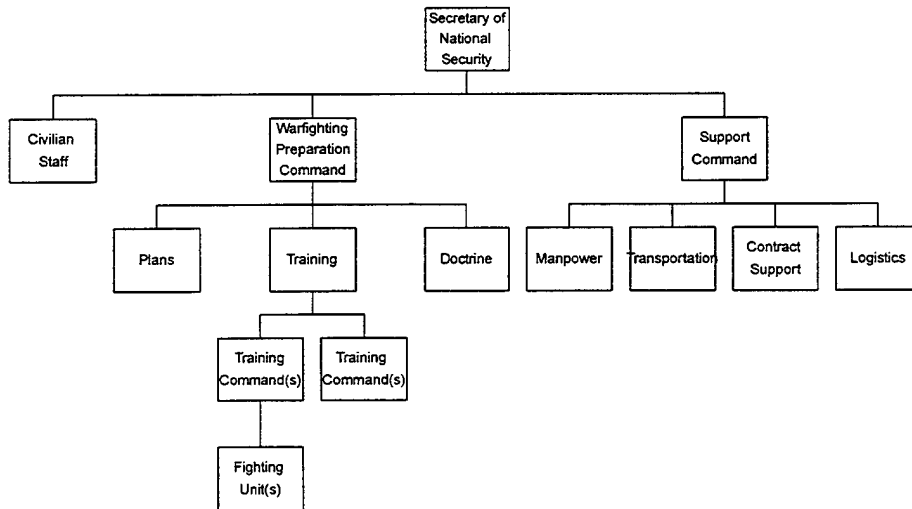



Figure 1: Department Administrative Organization

more than 100 personnel, comparable to platoon size. They comprise the basic tactical unit. Some Fighting Units have specialized tasks such as missile defense, long-range precision strike, or information disruption, but most consist of combined-arms, multi-mission forces. A ship and her crew constitute a Fighting Unit. Another type of Fighting Unit is the commander and staff, ensuring they train together for a variety of missions. Organized and trained in their Fighting Unit, warfighters deploy in these units when assigned an operation. Thus the basic

organization retains unit integrity and long-term relationships with commanders.

The Support Command provides the forces for planning, procuring, and providing administrative, transportation, logistic, and medical support to the warfighters. With a separate structure and career pattern, support personnel organize similarly to the warfighters into small Support Units capable of being combined to meet mission requirements. They generally support the warfighters while remaining under control of the Support Command. Command and specialized Support Units lead peacekeeping operations focusing on combat service capabilities. The Strategic Combat Commander, as the single combat commander, reports directly to the National Command Authority (see Figure 2). Permanent regional commands of military representatives, with a small operations and intelligence staff, coordinate United States action with allies, provide expertise in regional matters and advise the Strategic Combat Commander. As possible operational theaters develop, the Strategic Combat Commander assigns a Theater Task Commander, with battle staff, who determines mission requirements and defines the mission commands required. Small Fighting Units are drawn from the Warfighting Preparation Command as required and Mission Commanders assigned as needed. The presence mission requires a permanent commander controlling all forward deployed units not participating in a designated

theater. The Strategic Combat Commander and permanent staff  coordinate the activities of theater and presence commands thereby ensuring all actions complement each other.

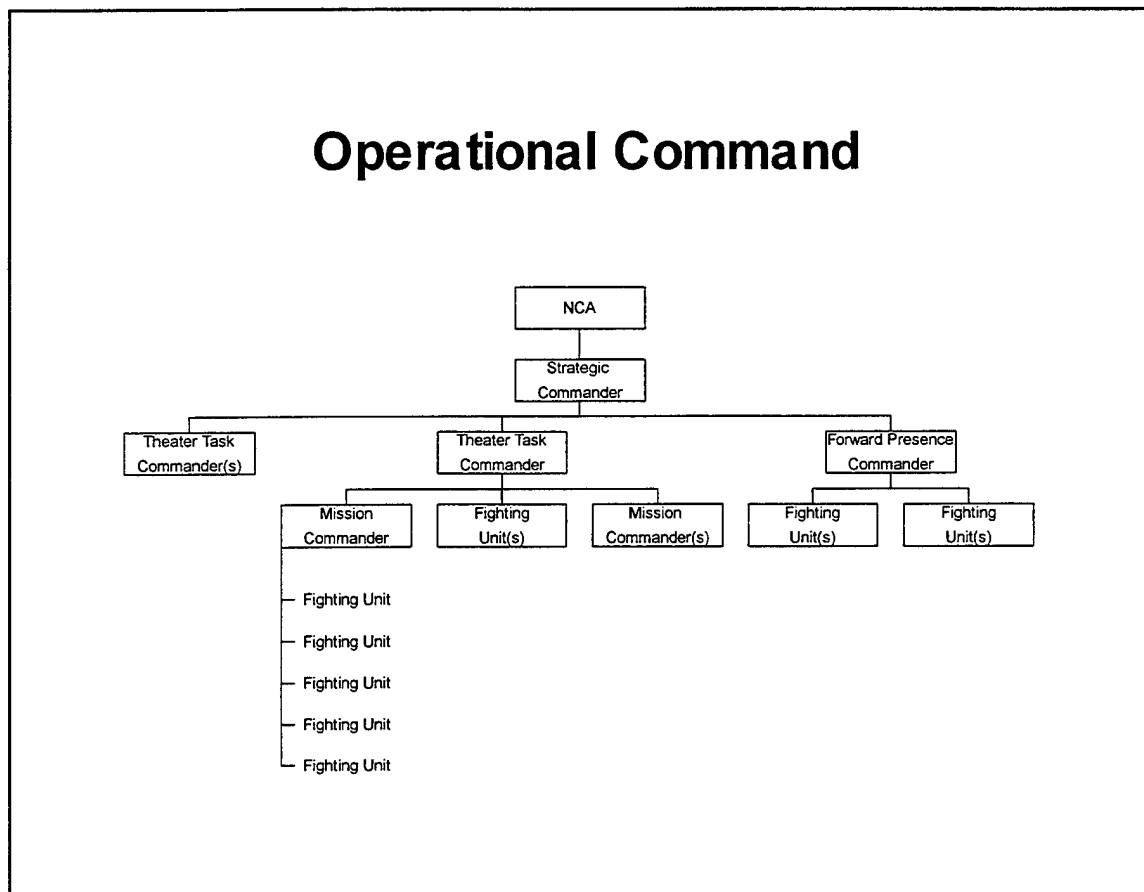


Figure 2: Operational Organization

While there are many implications concerning weapons systems, delivery platforms, and technology advances that emerge from this scenario, the following discussion will be limited to the impact of flattened organizations and quickly composited major commands on command and control. How will the commander effect the decision-making and leadership aspects of command in order to assess and influence the battle?

Flattening structure applies to all levels of command. Transitioning to a Strategic Combat Commander commanding multiple theater commanders administratively reduces the number of permanent staffs required. More importantly this transition simplifies the organization and provides greater flexibility in establishing areas of responsibility based on situational need. The requirement exists for regional experts to provide the link to allies, but these should not be tied to arbitrary geographic areas. As alliances and conflict between countries change, experts can move, without the need to redraw permanent command lines. Contingency commands also permit the theater commander to focus completely on the assigned mission.

A flattened organization with its increased span of control expands horizontal as well as vertical situational awareness. Commanders' access to a common picture enhances cohesion between units and enables more flexible response.²¹ The relationship of tactical to strategic levels of war demands that tactical commanders maintain a thorough understanding of operational and strategic goals and objectives. They must also be able to visualize how their tactical goals complement or detract from the strategic goal. Increased vertical awareness enables both tactical and strategic leaders to fight or at least observe and advise on the other's war. Strategic leaders now have the capability to direct tactics.

Flattening the organization, in conjunction with improved command and control technology, drive the changes in our concepts of levels of war. In fact, as strategic and tactical levels grow closer the concept of an operational level of war, needed to transition between strategic and tactical levels, may cease to have meaning.

Because major commands are quickly composited and disbanded, commanders find their view of leadership roles changed. Little allegiance develops between senior commanders and personnel in the Fighting Units. Mission and theater commanders have minimal personal contact and rely on the Fighting Unit commanders to provide that contact. Staffs are well acquainted with their commander, but have little personal knowledge of the units assigned. The Fighting Unit commanders must gain and mold the loyalty and trust of their troops and communicate a sense of their physical and emotional state to senior commanders. Strategic leaders must focus on information. With all information available and with the impracticality of physically walking the battlespace, some theaters are best served by the senior commanders operating from a location physically remote from the theater.

Decision-making also has changed. The simultaneity of strategic and tactical levels of war requires short decision cycles. To succeed in the environment that created this type of command structure, commanders must be

adaptable, versatile, and flexible. They must be able to manipulate many concepts at once and to plan intuitively. This versatile commander must adeptly use all forces available. Employing ground forces, remotely piloted vehicles for close air support, and space assets as precision strike weapons, the Fighting Unit commander must clearly understand a three-dimensional war. Flexibility is needed in an ever-changing hierarchy of command, of training and taskings to multiple types of missions and rules of engagement. Traditional staff planning, while sufficient for long-range plans, is too time-consuming in actual operations. Therefore commanders and staffs rely heavily on their well-developed intuitive decision-making skills.

Let us now assume that the foregoing projection indicates roughly where the military should be in 2025. If so, then what kinds of interim changes should be effected in 2000-2010 in order to transition to that future? The generals and colonels of 2025 start their training as lieutenants soon. We must ensure they are prepared to lead effectively in the future. This historical snapshot of the near-term future shows the beginning actions taken to transition to the proposed 2025 concept.

We continue to rely on major weapons platforms such as tanks and carriers in 2010, but their vulnerability is becoming apparent. Precision strike weapons are available,

but not for use by individual ground fighters. Information technology provides commanders at all levels with broadcast strategic, operational, and tactical data, and command and control support systems have the ability to filter the information and thereby provide the commander with intelligence tailored to his needs. Command and control systems are now sufficiently fast and detailed such that the National Command Authority could control the tactical battle. Media news coverage of all international events is transmitted to unit commanders, enabling them to be well-versed in strategic issues.

We maintain four services, but they rarely operate independently. Regional combatant commanders effect National Military Strategy, with operational area theater commanders assigned as the situation requires. Theater commanders assign missions to subordinate commanders and provide them with a suitable joint force. As a result of technological improvements, the commander's span of control is increasing, thus enabling direction of a more diversified force with fewer intermediate commands. Because of the availability of information and its ease of manipulation, command staffs have ceased to grow. Rather, they are beginning to decline. Staff serving as researchers, messengers, processors of information and technicians are disappearing. Principal staff officers have become familiar with automated tools and provide the commander with needed

assessments and plans. Control measures are disseminated and monitored through the automated systems as well. Increased span of control and reduced staff size are the first steps in eliminating some levels of command. They are no longer needed, and in fact, can hamper timely operations.

Establishment of a centralized logistics command providing supporting logistics operations relieved the strategic and operational level commanders of some of their logistics burden. At the tactical level, logistics remains a primary concern in planning and conducting operations.

Separate land/air/sea component commanders were replaced within the theater commands by task or mission commanders. They are provided with forces to operate in all required mediums. The regional commanders retain service component commanders as an advisory crutch until such time as senior officers are confident in their use of all forces.

Recognizing the need to move to smaller, task-organized units, the Army and Marine Corps have begun to reduce the number of levels in the hierarchy of command. With the division as its principal tactical element, the Army eliminated the staffs between it and the theater task commanders. Within the division brigade staffs are being eliminated and division commanders operate directly with their battalions. The Marines continued their focus on Marine Expeditionary Units as their basic task-organized

organization, with Marine Expeditionary Forces reserved primarily for major contingencies. The Marines also have started eliminating mid-level structure within their ground and aviation organizations, regiments and groups, reflecting their usage in combined-arms task organizations.

While technology has improved their ability to communicate the battle picture across commands, Navy and Air Force command changes have been minimal, probably due to the nature of their environment. The Air Force completed its restructuring of major commands in the early 1990's, which enhanced its ability to provide the appropriate mix of air power to the battle. Shipboard command has always required mission-type orders; therefore few naval changes were needed, mainly because of the physical separation of naval forces.

The consequences of the transition to this new command and control structure are becoming apparent. Senior commanders dislike their separation from the personalities of the tactical units, but are finding themselves better prepared. Small unit cohesion is vital and we must ensure individuals have a long-term relationship with one unit.

The evolving flattened command structure requires changes in commander development. Thinkers, planners, and commanders do not necessarily exhibit the same qualifications. Also a tactician is not necessarily a commander. With a flatter organization, there are many

commands at the low end and very few at the top. If we want to ensure we have only the best commanders, then perhaps we should begin to treat command as a specialty field. A majority of the career of a commander should be spent in command or command preparation. Flattening the organization has also revealed a need for grade restructure. With command opportunities at three levels, the traditional seven steps to general officer seem excessive.²²

Commanders must be able execute mission-type orders and act intuitively. Without forgetting the benefits of the past focus on deductive analysis, intuitive decision-making is now a primary concern. Intuitive decision-making is cultivated from the earliest schools through simulation, war-games, and exercises. These begin as individual computer games during which lieutenants pit themselves against the computer. Staffs are taught to plan in conjunction with the commander's intuitive decisions. Instead of a rigid cycle and format for decision-making, which generates a cost/benefit analysis of a finite set of actions, proposals become a stimulus and challenge for arriving at an optimal solution.

Providing a common picture of the battlefield to all commanders, while enlightening, also causes unwanted changes in outlook. Many examples exist of small unit effort winning a battle thought lost by senior commanders. Or the alternative, commanders not withdrawing or committing

reserves early because they were unaware of battle casualties, to the overall benefit of the campaign. Commanders will have to consider carefully the composite view in relation to their focused view, and maintain that focus.

Given their Roles and Missions and budget concerns, the Services are planning for the next 5-7 years. Recent and current acquisition projects must be supported to validate their purchase. Having been institutionalized, we find it difficult to get outside the box and think of a future operating on different principles. Any agreement to cede functions to another Service could lead to role and funding cuts. Certainly no Service wants to give the impression of no longer being needed.

In fact, the National Security Strategy needs all the functions, and will need them. We must study functional vice service unique capabilities. The future missions require all four mediums (land, air, sea, and space) to effect the military arm of national strategy. The nation deserves the best direction possible of its military forces. We must consider and evaluate changes in service structure and command relationships, if for no other reason then to ensure we chose the correct path.

Some of these suggested changes will occur because present day issues are driving them. First, the American population does not want to pay for a costly military force,

but they do want a well-trained, capable force when it is needed. Because of on-going reductions in force, the manpower requirements to staff this structure will not change significantly. This is not a plan for force reduction. Secondly, the new technologies are relatively inexpensive, and becoming cheaper. They offer an easy way for a small power to have a large influence.²³ The best way to combat a similar force is to be an expert in the use of new technology. We know the next wars will be fast-paced and complex. In addition to giving us a new medium of war, information age technology provides a way to satisfy the public's wishes.

This future structure for an information age military force relies heavily on technology. What happens when it doesn't work? As warfare proponents adopt technological solutions to fight better, there is always some probability that something will go wrong. Operating in a degraded mode is not new to the battlefield; something always breaks. Work-around solutions must suffice until repairs are made.

We must guard against possible system failure by reducing the chance of failure through redundant systems and plug-in parts. But if the automated command and control systems fail, how does it affect command? The changes to command structure, education, and prior access to the command and control systems before their failure will enhance the commander's ability to cope within a degraded

battlespace. The commanders at each level have been acquainted with the strategic and operational goals. They have their mission and understand the commander's intent. As done in the past, commanders trained to operate with mission-type orders and aware of the general situation, continue to operate without external control until communications are reestablished.

Finally, can we get there from here? And do we want to? We must! The 2025 target is a fictional future that will never totally materialize. But some portions of it will. We need to act now to begin the transition to this or other worthwhile long-range restructuring. There will be a reduction in force. Technology will continue to be smaller, cheaper, and faster. There will be a need for a well-equipped, well-led military. We must actively consider creating a new command structure that anticipates future missions and attempts to remove service parochialism from discussions of future doctrine. We must immediately start realigning our educational institutions to develop a truly joint environment. We must develop and teach intuitive approaches to decision-making and crisis action planning.

We must start acting on the near-term solutions. Otherwise we will remain a Desert Storm attrition based armed force in a century of information maneuvering. We are by nature tradition-bound and slow to accept change. The revolution in military affairs dictates that the military

mind can no longer be static, rather we must be continually evolutionary.

Endnotes

1. With a bibliography including several science fiction works, this must be a work of fiction. The application of military power proposed by Heinlein and Card have been stimulating and provocative. Gene Roddenberry's *Star Trek* and Anne McCaffrey and Elizabeth Moon's *Sassinak* (New York, Baen Publishing, 1989) also shaped my thoughts.

2. Michael Hammer and James Champy, Reengineering the Corporation: A Manifesto for Business Revolution, (New York: HarperBusiness, HarperCollinsPublishers, 1993), chap 1, 2, and 4 passim.

3. Joint Chiefs of Staff, Dictionary of Military and Associated Terms, Joint Publication 1-02, (Washington: Government Printing Office, 1989).

4. U.S. Marine Corps, A Concept of Command and Control, Fleet Marine Force Reference Publication 15-3 (Washington: U.S. Marine Corps, 3 August 1994), 16-18.

5. Joint Chiefs of Staff, Doctrine for Joint Operations, Joint Publication 3-0 (Washington: Joint Staff, 9 Sep 1993), II-19 - II-21.

6. Department of the Army, Operations, Field Manual 100-5 (Washington: U.S. Department of the Army, 14 Jun 1993), 2-14.

7. Department of the Army, Force XXI Operations: A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-First Century, TRADOC Pamphlet 525-5 (Fort Monroe, Virginia: U.S. Department of the Army, 1 Aug 1994), 2-8 - 2-10, 3-3 - 3-8.

8. Department of the Air Force, Global Reach-Global Power, Air Force White Paper (Washington: U.S. Department of the Air Force, December 1992), 5,13.

9. Department of the Air Force, Air Force Restructure, Air Force White Paper (Washington: U.S. Department of the Air Force, September 1991).

10. U.S. Navy, Force 2001, A Program Guide to the U.S. Navy (Washington: Chief of Naval Operations, 1994).

11. It is not surprising that fictional space militaries are modeled after the terrestrial navy. The concept of traveling between planets or star systems is more like an ocean-going vessel making short port visits, rather than an aircraft flight between bases.

12. U.S. Marine Corps, Command and Control, Fleet Marine Force Manual 3 (Washington: U.S. Marine Corps, 16 Jun 1993), 7,13.

13. U.S. Marine Corps, A Concept for Command and Control of the MAGTF, Fleet Marine Force Reference Publication 14-33 (COORDINATING DRAFT) (Washington: U.S. Marine Corps, 23 Jan 95), 14.

14. Some of these ideas surfaced through work on an Army War College class project on the Revolution in Military Affairs, Operation and Organization Concepts. Project members were Col James O. Newhouse, USAFR, LTC Robert H. Reardon, Jr., USA and the author.

15. Alvin Toffler and Heidi Toffler, War and Anti-War: Survival at the Dawn of the 21st Century (Boston: Little, Brown and Co., 1993). 1st wave societies are agrarian-based. 2nd wave are of the industrial age and we are moving into the 3rd wave, information.

16. Heinlein's "bounce suits" are not available, but personal exoskeletons replace heavy, cumbersome body armor.

17. Col Doug Williams, USA, Faculty Instructor, U.S. Army War College. Concept presented during the course, "Revolution in Military Affairs," Feb 1995.

18. Another consideration is the use of remotely piloted vehicles. If RPV's are capable of providing close air support, they could be controlled/operated by the ground units they are supporting.

19. The ultimate form of fire support is a warfighter carrying a weapon that can be pointed at a target and the target eliminated by the most suitable means. Centralizing fire support without limiting a commander's options will require virtually unlimited resources. Fire support like logistics will need to be negotiated prior to conduct of the battle.

20. Just as private industry is contracting out much of its warehousing, transportation and supply needs, warfighters will identify their requirements and the supporters will provide. Supporters monitoring the command networks will be aware of the general nature of requirements. If the mission calls for Unit 1 to displace to Location B, then, like a rental car company, the appropriate transportation will arrive at Unit 1's location. During campaign mission formulation, the support commander will agree with the strategic combat commander on the supportability of the campaign.

21. Office of the Secretary of Defense (Net Assessment), Report on the Proceedings of the Workshop on Dominating Maneuver 16-18 Aug 94, US Army War College, Carlisle Barracks, PA (Strategic Assessment Center, Science Applications International Corporation, October 1994), Group A report.

22. Perhaps slower promotions, but greater step pay increases. Should there be three grades, with the first five years in each serving as learning periods prior to command? The problem with small unit commanders deciding strategic issues is generally a lack of experience. How can an officer gain these skills? Are junior officers assigned to teams within the unit, taking what is traditionally a senior enlisted billet? With the push to increase understanding of the battlefield to the lowest level, it could be carried to the point of eliminating all enlisted ranks or requiring privates to have college degrees. If junior officers are not given command, how do they learn?

23. Toffler, 179-189.

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